Field Testing of New Interference-Free Ozone Monitors

Mid-Atlantic Regional Air Management Association
MARAMA Monitoring Committee Meeting
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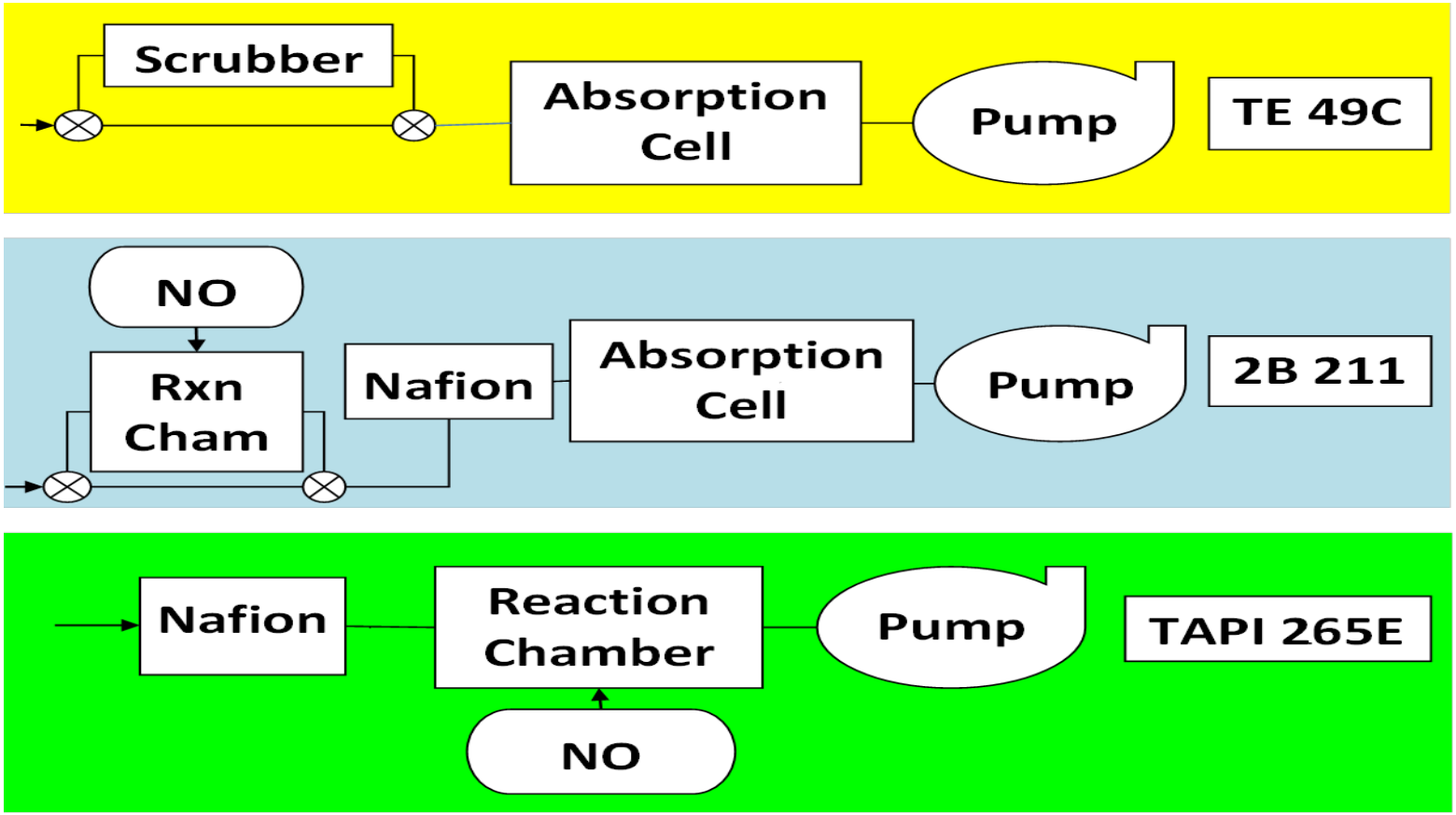
Do we know what the O3 monitor's really measuring?

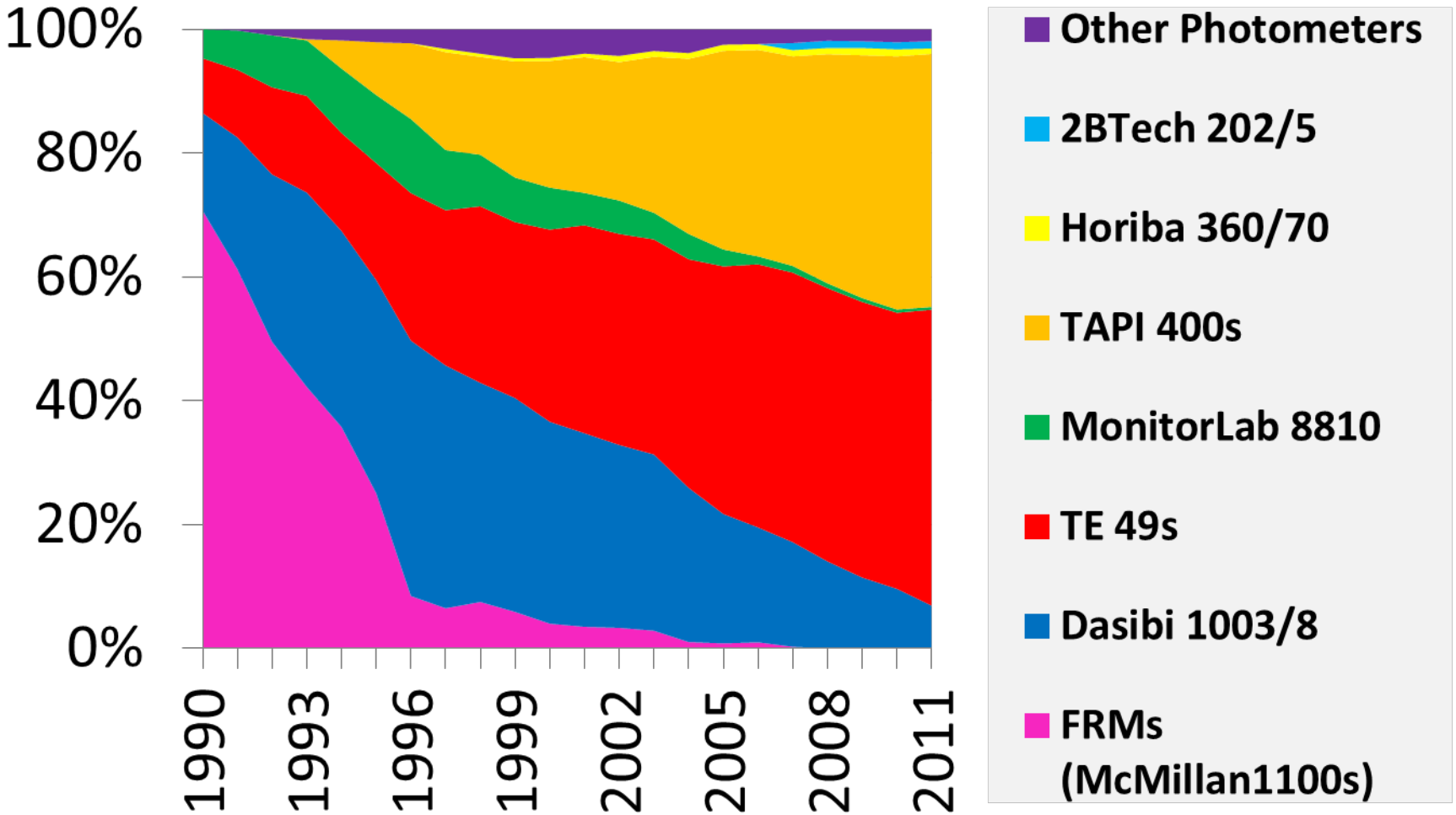
- **O3 photometers may have up to 60 ppb bias and drift 20 ppb daily; however, the 2013 O3 ISA** (EPA 600/R-10/076F) **notes that such FEM certification criteria** ***"should be revised to more accurately reflect the necessary performance requirements for O3 monitors used to support the current NAAQS".***
- **NIST staff notes** (Norris et al. 2013 JAWMA 63: 565-574) **that** "***regular audits currently provide reliable measures of field monitor bias and precision in response to challenges of O3 in zero air, although not of sample matrix effects arising from ambient humidity and interfering species".***

Ozone Monitor Types

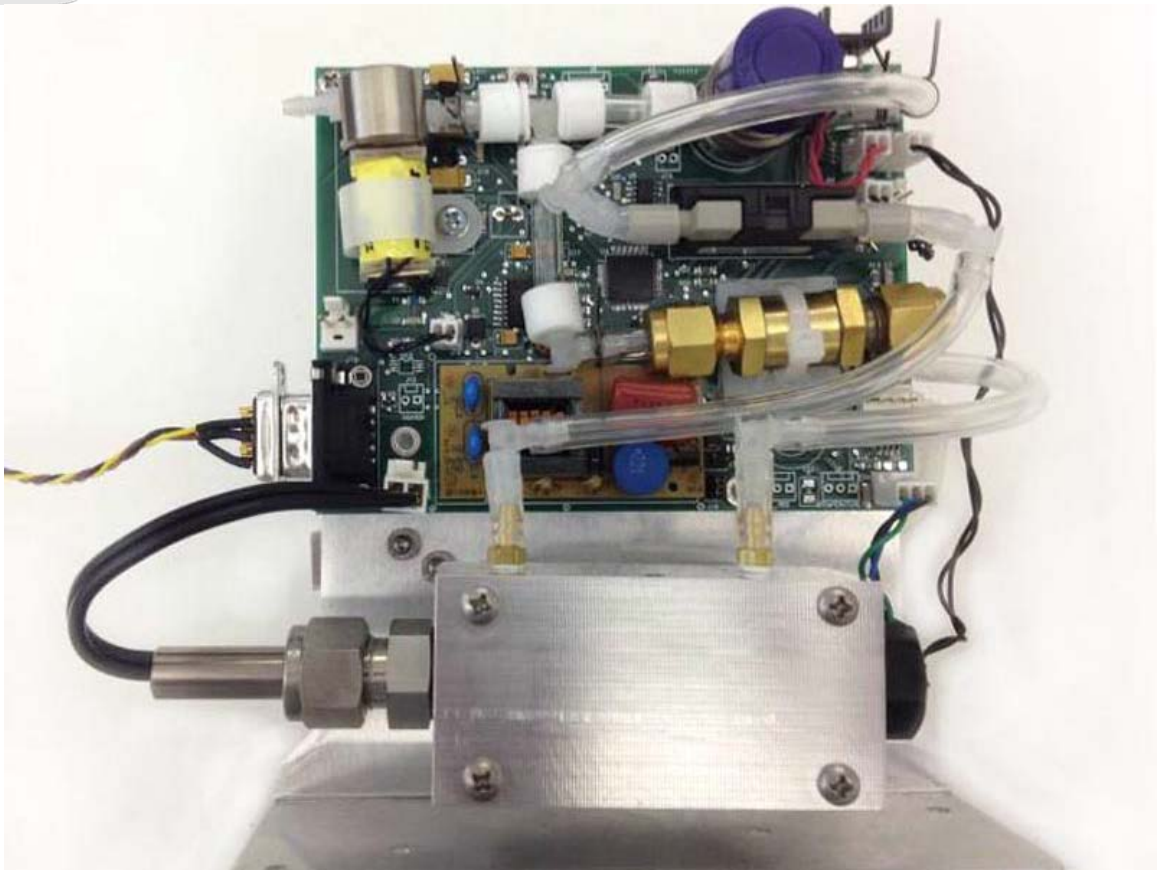


EPA's currently evaluating 2B Technologies 211 and Teledyne-API 265E monitors as new ozone *FRMs*

Percent O3 Monitor Share U.S. Network (1990-2011)



GPT Scrubberless Module™



Drop-in NO-scrubbers are commercially available to convert Teledyne-API & Thermo photometers to “interference-free” (H2O, Hg, aromatic VOCs) O3 monitors.

O3 Photometer Interferences

Interferents	O3 Equivalent Range
O3	1.0
Hg vapor	76 - 1400
Styrenes	0 – 1.5
Arene Aldehydes	0 – 0.8
Phenols	0 – 2.2
2-Nitrotoluene	0 – 0.8
Naphthalene	0 – 1.2

Spicer et al. (2010) JAWMA 60: 1353-1364.

TE 49C, 2B 211 & TAPI 265E Collocated Houston Study

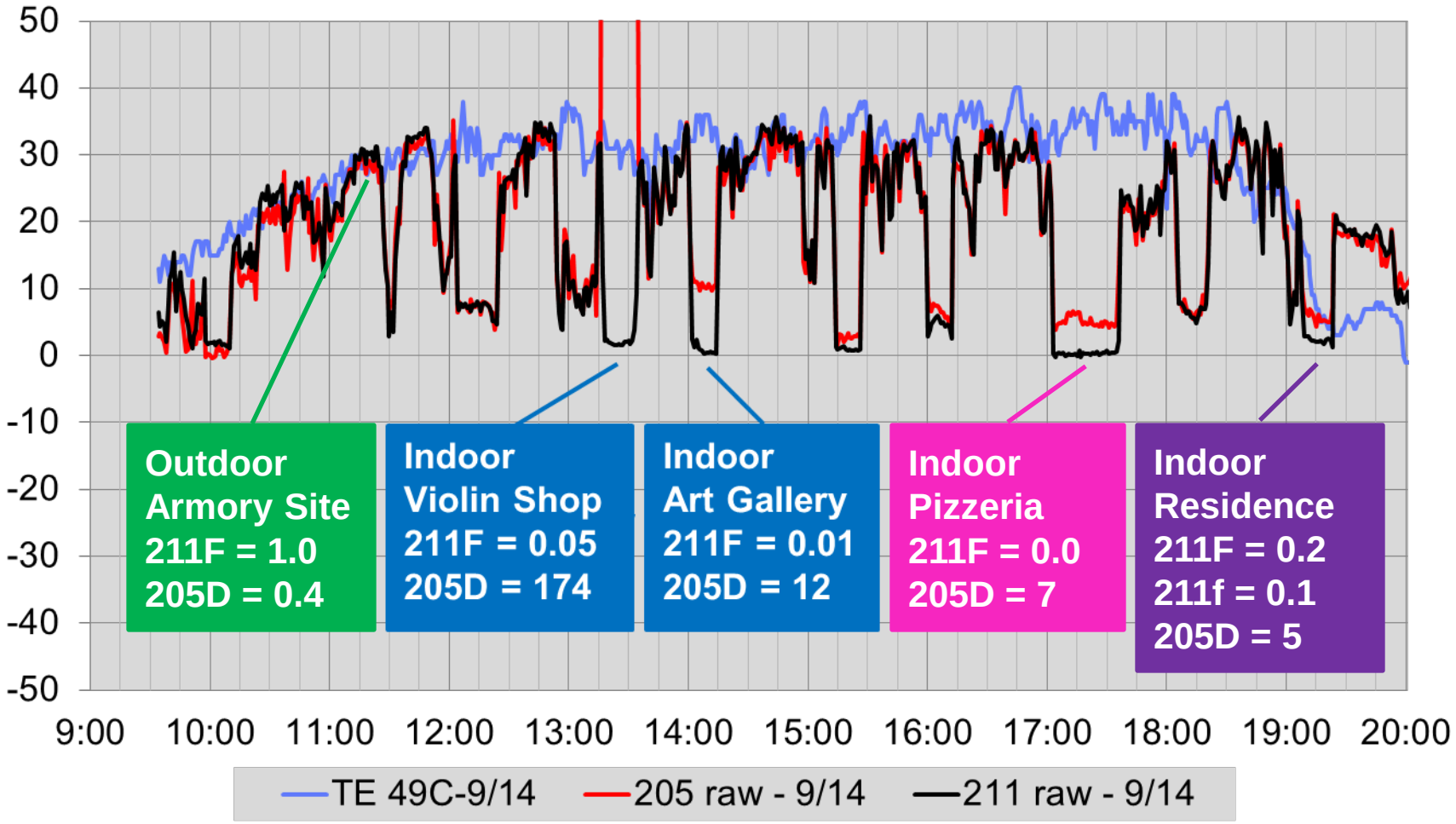
- Houston Ship Channel HRM3 Site - August 26 to November 19, 2010
- QA/QC - Daily zero/span, weekly 3-point/monthly 5-point calibrations & quarterly audit
- Overall, high monitor correlation (R2 = 0.99) & slope agreement (1.0 ± 0.01)
- TE 49C reported highest values and more 75 ppb 8-hour daily maximum NAAQS exceedances
- TE 49C 8-hour average values up to 4 ppb higher & hourly average values up to 7 ppb higher.

Ollison et al. (2013) JAWMA 63: 855-863

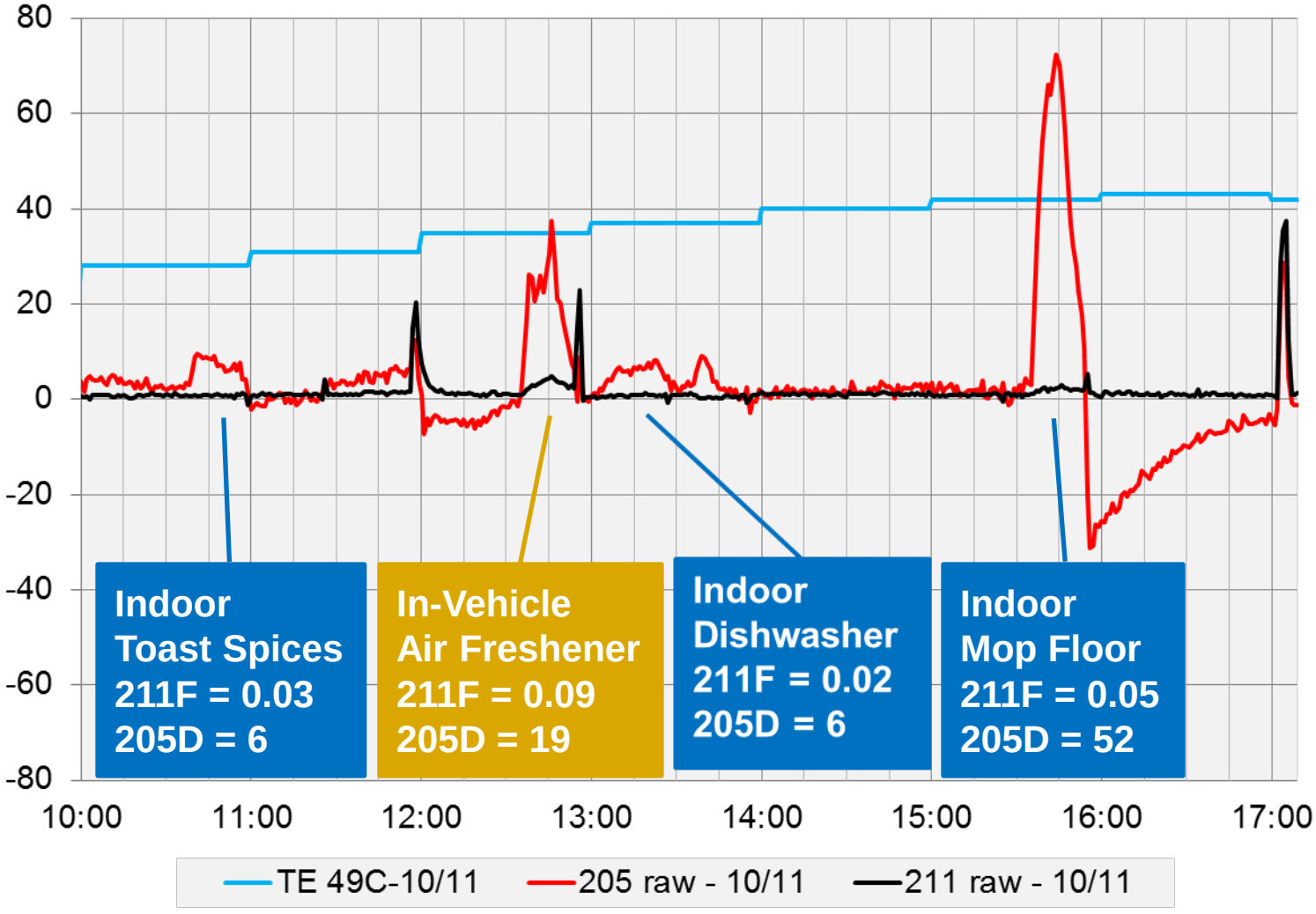
Mobile 205/211 Monitor Cart 2012 Durham, NC ME Study

Johnson et al. (2013) JAWMA (in press) **Armory Site (Google Maps)**

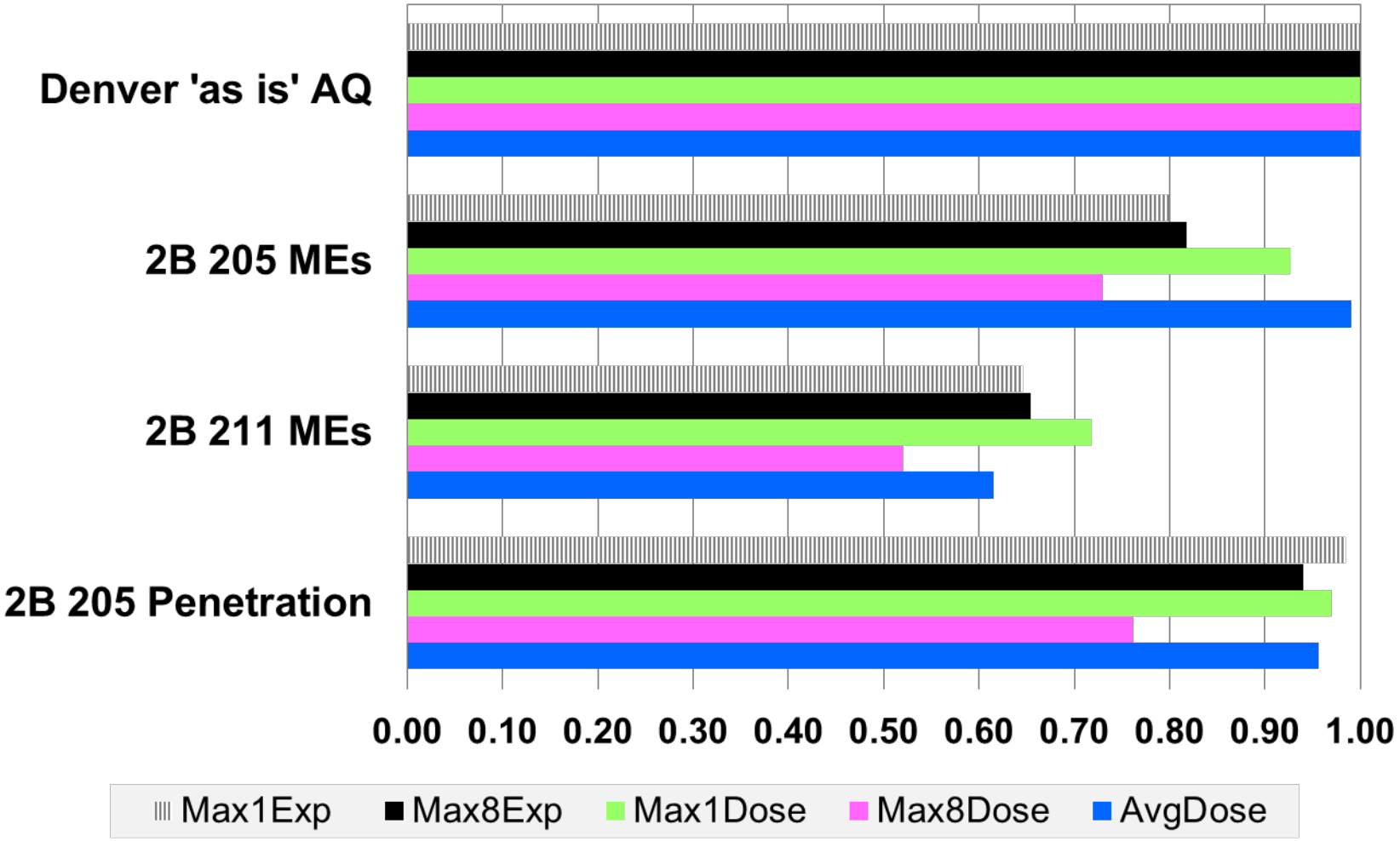
Indoor 211 ME Factor (211F) & 205-211 Difference (205D)



Home Task 211 ME Factor (211F) & 205-211 Difference (205D)



Monitor Bias Effects on APEX Median O3 Exposure & Dose



Monitor Accuracy Matters

- **Exceedances of ambient O3 standard levels are reduced with photometer upgrades**
- **Modeled population exposure, dose, and risk are lessened**
- **Relative benefits of emission control scenarios may change**